CLAIMS

What is claimed is:

1.   A method for automatically processing and managing
2 spatial asset information in a repository, the method comprising:
defining instances of primary observation types and
4 associations between each of the specific instances;
identifying reference networks and geographic information
6 system asset layers in the repository;
configuring the repository based on said instances definitions
8 and said associations;
collecting field data;
10 converting said collected field data to specific observations;
correlating said specific observations to the appropriate said
12 reference network and said geographic information system asset
layers; and
14 updating said appropriate geographic information system asset
layers in the repository.

2.   The method defined in Claim 1 further comprising:
2 configuring automatically analysis tools to exploit data in
the repository so that said analysis tools are based on said
4 instances definitions.

3.   The method defined in Claim 1 wherein said collecting of

field data step further comprises:

capturing free speech stating verbal observations containing

voice data;

capturing location data contemporaneously with each of said

verbal observations;

time-stamping each of said captured verbal observations to

create a raw verbal observation; and

time-stamping said captured location data.

4.   The method defined in Claim 3 further comprising:

using a mobile unit computer in communication with a global

positioning satellite receiver to capture said location data.

5.   The method defined in Claim 3 further comprising:

using a mobile unit computer in communication with a sound

board for capturing said free speech stating verbal observations

containing voice data.

6.   The method defined in Claim 3 further comprising:

constructing a predefined reference grammar for said voice

data to be captured;

incorporating a semantic relationship structure in said

predefined reference grammar; and

6 using said predefined reference grammar and said semantic

relationship structure to enable said voice data in at least two of

8 said raw verbal observations to be combined automatically with said

captured location data into a single record in a geographic

10 information system database.

 7. The method defined in Claim 6 further comprising:

2 using a mobile unit computer for capturing both said location

data and said free speech stating verbal observations containing

4 voice data; and

 transferring said captured location data and said captured

6 voice data from said mobile unit computer to a processing computer,

wherein said processing computer combines said captured voice data

8 and said captured location data into said single record which is

stored in said geographic information system database which is

10 connectable to said processing computer.

 8. The method defined in Claim 6 further comprising:

2 configuring said predefined reference grammar and said

semantic relationship structure to a specific form for a specific

4 application.

 9. The method defined in Claim 8 wherein said specific

2 application is a street maintenance application and said predefined

reference grammar and said semantic relationship structure are

4 configured to said specific form for use in said street maintenance

application.

10. The method defined in Claim 6 further comprising:

2   time-stamping all records in said geographic information

system database using only a central processing unit clock of a

4 computer.

11. The method defined in Claim 10 further comprising:

2   capturing a third stream of sensor data;

time-stamping all said captured third stream of sensor data

4 by said central processing unit clock of said computer; and

combining automatically specific items of sensor data into

6 specific records having specific voice data and specific location

data by using said time-stamping as a synchronizing key.

12. An apparatus for automatically processing and managing
2 spatial asset information in a repository, the apparatus
comprising:

4 defining means for defining instances of primary observation
types and associations between each of the specific instances;

6 identifying means for identifying reference networks and
geographic information system asset layers in the repository;

8 configuring means for configuring the repository based on said
instances definitions and said associations;

10 data collection means for collecting field data;

converting means for converting said collected field data to
12 specific observations;

correlating means for correlating said specific observations
14 to the appropriate said reference network and said geographic
information system asset layers; and

16 updating means for updating said appropriate geographic
information system asset layers in the repository.

13. The apparatus defined in Claim 12 further comprising:
2 configuring means for automatically configuring analysis tools
to exploit data in the repository so that said analysis tools are
4 based on said instances definitions.

14. The apparatus defined in Claim 12 wherein said data
2 collection means captures free speech stating verbal observations

containing voice data and also captures location data

4 contemporaneously with each of said verbal observations, and

wherein the apparatus includes time-stamping means for time-

6 stamping each of said captured verbal observations to create a raw

verbal observation and for time-stamping said captured location

8 data.

15. The apparatus defined in Claim 14 wherein said data

2 collection means includes a mobile unit computer in communication

with a global positioning satellite receiver to capture said

4 location data.

16. The apparatus defined in Claim 14 wherein said data

2 collection means includes a mobile unit computer in communication

with a sound board for capturing said free speech stating verbal

4 observations containing voice data.

17. The apparatus defined in Claim 12 further comprising:

2 reference grammar means for interpreting captured voice data

contained in a plurality of verbal observations;

4 said reference grammar means incorporating a semantic

relationship structure means for combining said captured voice data

6 contained in at least two of said plurality of verbal observations;

and

8   data conversion processing means for using said reference

grammar means and said semantic relationship structure means to

10   enable said captured voice data in said at least two of said

plurality of verbal observations to be combined automatically with

12   said captured location data into a single record in a geographic

information system database.

18. The apparatus defined in Claim 17 wherein said data

2   collection means includes a mobile unit computer for capturing both

said location data and said free speech stating verbal observations

4   containing voice data, and wherein the apparatus further comprises:

a processing computer and a data transfer means for

6   transferring said captured location data and said captured voice

data from said mobile unit computer to said processing computer

8   which combines said captured voice data and said captured location

data into a single record which is stored in said geographic

10   information system database connectable to said processing

computer.

19. The apparatus defined in Claim 17 further comprising:

2   a grammar configuring means for configuring said reference

grammar means and said semantic relationship structure means to a

4   specific form for a specific application.

20. The apparatus defined in Claim 19 wherein said specific

2 application is a street maintenance application and said reference

grammar means and said semantic relationship structure means are

4 configured to said specific form for use in said street maintenance

application.

21. The apparatus defined in Claim 17 wherein said time-

2 stamping means time-stamps all records in said geographic

information system database using only a central processing unit

4 clock of a computer.

22. The apparatus defined in Claim 21 wherein said data

2 collection means captures a third stream of sensor data, and

wherein said time-stamping means time-stamps all captured third

4 stream of sensor data by said central processing unit clock of said

computer, and wherein said converting means automatically combines

6 specific items of sensor data into specific records having specific

voice data and specific location data by using said time-stamping

8 as a synchronizing key.

23.   Computer-readable media tangibly embodying a program of
instructions executable by a computer to perform a method for
automatically processing and managing spatial asset information in
a repository, the method comprising:

defining instances of primary observation types and
associations between each of the specific instances;

identifying reference networks and geographic information
system asset layers in the repository;

configuring the repository based on said instances definitions
and said associations;

collecting field data;

converting said collected field data to specific observations;

correlating said specific observations to the appropriate said
reference network and said geographic information system asset
layers; and

updating said appropriate geographic information system asset
layers in the repository.

24.   The computer-readable media defined in Claim 23 further
comprising:

configuring automatically analysis tools to exploit data in
the repository so that said analysis tools are based on said
instances definitions.

25. The computer-readable media defined in Claim 23 wherein

2 said collecting of field data step further comprises:

capturing free speech stating verbal observations containing

4 voice data;

capturing location data contemporaneously with each of said

6 verbal observations;

time-stamping each of said captured verbal observations to

8 create a raw verbal observation; and

time-stamping said captured location data.

26. The computer-readable media defined in Claim 25 wherein

2 the computer is a mobile unit computer in communication with a

global positioning satellite receiver to capture said location

4 data.

27. The computer-readable media defined in Claim 25 wherein

2 the computer is a mobile unit computer in communication with a

sound board for capturing said free speech stating verbal

4 observations containing voice data.

28. The computer-readable media defined in Claim 25 further

2 comprising:

constructing a predefined reference grammar for said voice

4 data to be captured;

incorporating a semantic relationship structure in said

6 predefined reference grammar; and

using said predefined reference grammar and said semantic

8 relationship structure to enable said voice data in at least two of

said raw verbal observations to be combined automatically with said

10 captured location data into a single record in a geographic

information system database.

29. The computer-readable media defined in Claim 28 wherein

2 the computer is a mobile unit computer used for capturing both said

location data and said free speech stating verbal observations

4 containing voice data, and further comprising:

transferring said captured location data and said captured

6 voice data from said mobile unit computer to a processing computer,

wherein said processing computer combines said captured voice data

8 and said captured location data into said single record which is

stored in said geographic information system database which is

10 connectable to said processing computer.

30. A computer programmed to execute a process for

2   automatically processing and managing spatial asset information in

a repository, the process comprising:

4   defining instances of primary observation types and

associations between each of the specific instances;

6   identifying reference networks and geographic information

system asset layers in the repository;

8   configuring the repository based on said instances definitions

and said associations;

10   collecting field data;

converting said collected field data to specific observations;

12   correlating said specific observations to the appropriate said

reference network and said geographic information system asset

14   layers; and

updating said appropriate geographic information system asset

16   layers in the repository.

31. The computer as in Claim 30 wherein the process further

2   comprises:

configuring automatically analysis tools to exploit data in

4   the repository so that said analysis tools are based on said

instances definitions.

32. The computer as in Claim 30 wherein the process further

2   comprises:

capturing free speech stating verbal observations containing

4   voice data;

    capturing location data contemporaneously with each of said

6   verbal observations;

    time-stamping each of said captured verbal observations to

8   create a raw verbal observation; and

    time-stamping said captured location data.

    33.   The computer as in Claim 32 wherein the process further

2   comprises:

    using a mobile unit computer in communication with a global

4   positioning satellite receiver to capture said location data.

    34.   The computer as in Claim 32 wherein the process further

2   comprises:

    using a mobile unit computer in communication with a sound

4   board for capturing said free speech stating verbal observations

    containing voice data.

    35.   The computer as in Claim 32 wherein the process further

2   comprises:

    constructing a predefined reference grammar for said voice

4   data to be captured;

    incorporating a semantic relationship structure in said

6   predefined reference grammar; and

using said predefined reference grammar and said semantic

8 relationship structure to enable said voice data in at least two of

said raw verbal observations to be combined automatically with said

10 captured location data into a single record in a geographic

information system database.

36. The computer as in Claim 35 wherein the process further

2 comprises:

using a mobile unit computer for capturing both said location

4 data and said free speech stating verbal observations containing

voice data, and

6 transferring said captured location data and said captured

voice data from said mobile unit computer to a processing computer,

8 wherein said processing computer combines said captured voice data

and said captured location data into said single record which is

10 stored in said geographic information system database which is

connectable to said processing computer.

37. An apparatus for automatically processing and managing

2 spatial asset information, the apparatus comprising:

a processing computer for receiving a plurality of field data

4 that has been collected; and

a data repository connectable to said processing computer for

6 receiving processing results of said processing computer, wherein

said data repository further comprises,

8 a plurality of reference networks;

a geographic information system having a plurality of

10 asset layers;

a plurality of pre-defined instances of primary

12 observation types; and

a plurality of pre-defined associations between each of

14 said plurality of pre-defined instances of primary observation

types, wherein said data repository is configured based upon

16 said plurality of pre-defined instances of primary observation

types and said plurality of pre-defined associations;

18 wherein said processing computer,

converts each of said plurality of field data into

20 an appropriate one of said primary observation types;

correlates each of said converted primary

22 observation types of each of said plurality of field data

to an appropriate one of said plurality of reference

24 networks and an appropriate one of said plurality of

asset layers; and

26   updates said appropriate one of said plurality of asset

           layers with each of said converted primary observation types

28   of each of said plurality of field data.

           38.   The apparatus defined in Claim 37 further comprising:

2   a mobile unit computer for collecting said plurality of field

   data; and

4   a radio frequency transmitter connectable to said mobile unit

   computer for transferring said collected field data to said

6   processing computer.

           39.   The apparatus defined in Claim 38 wherein said mobile

2   unit computer further comprises:

           a microphone connectable to a sound board for capturing free

4   speech stating verbal observations containing voice data; and

           a global positioning satellite receiver for capturing location

6   data contemporaneously with each of said verbal observations,

   wherein each of said captured verbal observations and said

8   contemporaneously captured location data is time-stamped to create

   a plurality of raw verbal observations.

           40.   The apparatus defined in Claim 39 wherein said data

2   repository further comprises:

           a geographic information system database;

4   a reference grammar for interpreting captured voice data

contained in said plurality of raw verbal observations, wherein

6   said reference grammar has a semantic relationship structure for

combining said captured voice data contained in at least two of

8   said plurality of raw verbal observations; and

a data converter for using said reference grammar and said

10   semantic relationship structure to enable said captured voice data

in said at least two of said plurality of verbal observations to be

12   combined automatically with said captured location data into a

single record in said geographic information system database.

41.   The apparatus defined in Claim 40 wherein said reference

2   grammar and said semantic relationship structure are configured for

a specific form for a specific application.

42.   The apparatus defined in Claim 41 wherein said specific

2   application is a street maintenance application and said reference

grammar and said semantic relationship structure are configured to

4   said specific form for use in said street maintenance application.

43.   The apparatus defined in Claim 40 wherein said processing

2   computer further comprises:

a processing computer clock used for time-stamping all records

4   in said geographic information system database.

44. The apparatus defined in Claim 43 wherein said mobile
2 unit computer captures a third stream of sensor data, and further
wherein said processing computer clock is used to time-stamp all
4 captured third stream of sensor data, and further wherein said data
converter automatically combines specific items of sensor data into
6 specific records having specific voice data and specific location
data by using said time-stamping as a synchronizing key.

45. The apparatus defined in Claim 37 wherein said data
2 repository further comprises:

a plurality of analysis tools automatically configured to
4 exploit data in said data repository based on said plurality of
pre-defined instances of primary observation types.